BIBLIOGRAPHICAL NOTICES.

ART. XII.—*Principles of Medicine: comprising General Pathology and Therapeutics, and a brief general view of Etiology, Nosology, Semeiology, Diagnosis, Prognosis, and Hygienics.* By CHARLES J. B. WILLIAMS, M. D., F. R. S., Professor of the Principles and Practice of Medicine, and of Clinical Medicine, and First Physician to the Hospital, University College, London, &c. &c. Second Edition, considerably enlarged. London, 1848: 8vo. pp. 533.

DR. WILLIAMS tells us in his preface that "more than a year has elapsed since the first edition of this work was out of print." The same we believe to be true of the two editions through which the work has already passed in this country. The present edition contains very extensive additions, "comprising the enunciation and application of most of the facts and established deductions made available to the science and art of medicine during the last few years. These additions pervade almost every portion of the work; but they preponderate in the following subjects:—

"In Etiology, *mechanical, chemical,* and *dietetic causes of disease, defective cleanliness, ventilation,* and *drainage.* In Pathology, the tabular views of the elements of disease; *reflex action and sympathy; elementary changes in the blood; congestion; determination of blood; inflammation,* in its nature, manifold results and modes of treatment; *degeneration of textures; exoplastic and aplastic deposits,* and their treatment, with a notice of the action of the *cod liver oil;* and the whole chapter on *Hygienics,* comprising *food, clothing, air, temperature, exercise, mental occupation, sleep,* and *excretion.*"—p. vii.

In endeavouring to adapt the work to the rapid improvements in medical science, in very few instances has the author found it necessary to retract or supersede the inferences and views set forth in the first edition. On many subjects they have been confirmed and extended by recent researches to a degree which has not less surprised than convinced him of their truth. When these views were opposed to those generally held, Dr. Williams was led to test them more severely by all the experiments which physiology, clinical observation, and pathological research could supply. The result has been a firmer and clearer conviction of their substantial truth. The reason given by Dr. Williams in his preface to the first edition of his work, for its publication, still obtains, namely—"that there is no work [in the English language] which fully treats of the subject of General Pathology, and its application to practical medicine. * * * * With many excellent and elaborate treatises on the details of medicine, we have scarcely any that treat of those general principles in the nature and treatment of diseases, which are really fundamental in the practice of medicine" There is much truth in the following observations of the author:—

"It seems quite extraordinary that, notwithstanding the recent rapid improvements and comparative perfections of the contributory sciences, practical medicine should still halt in the domain of empiricism. A chief reason for the anomaly seems to be, that science and practice have been rarely pursued by the same parties. Scientific men are not and cannot be practical, because they have had no experience: and practitioners know little of science, and therefore derive little good from it. Instead of working together, these parties are at issue with each other. But it is high time to put an end to this feud. Philosophers must descend from their transcendental positions, to consider details of practice and purposes of utility. Those who would be practitioners must gain from science that knowledge and that method which render experience instructive and useful."—p. x.

The proper foundation of medical studies, the only basis of practical medicine,

is *general pathology;* and Dr. Williams thinks, and justly so in our opinion, "that a chief reason why the practice of medicine has been commonly so distasteful, and so difficult in its study, and so unsatisfactory when tested at the bed side. is, because its foundation, *general pathology,* has not been efficiently taught." It is the connecting link between practical medicine and anatomy and physiology. Sound principles of medicine are the "embodiment of the results of experience in disease, with a knowledge of structure and function in health.

"The great proof of the practical utility of general pathology is, the aid which it gives in the study of clinical medicine, and the light which clinical medicine continually throws on it. The states which the practitioner has to treat are often too indefinite or too mixed to correspond with any of the definitions of special disease. They frequently consist of functional disorder, varying with time and circumstance, or changing its place, so as to present no fixed characters. But, compared by the pathologist with the standard of health, and analyzed from their complexity, their nature becomes intelligible, and their proper treatment obvious, so far as means are possessed to counteract or control that which is wrong."—p. 524.

Practitioners act more on general ideas of disease than on their knowledge of particular diseases.

"They feel the pulse and the skin. to guide them in the use of blood-letting, whether they have found out the special disease or not. They examine the tongue, and inquire as to the state of the evacuations, to guide them in the use of purgatives, under whatever complaint the patient labours. They consider the complexion and bodily strength in connection with dietetic measures; and the chief treatment of convalescence depends on rules suggested by general pathological knowledge."—p. 525.

"Throughout our examination of the details of disease, we shall find the principles of general pathology continually exemplified; and through these principles the mind can master the details to an extent wholly unattainable by those who pursue them as unconnected matters of fact. Those who begin the study of practical medicine by attempting to learn the details of diseases, are like those who would endeavour to master all the facts of chemistry without any knowledge of the general facts or laws of chemical action, affinity, and definite proportions: yet even in practical chemistry, or chemistry applied to the arts and manufactures, the most extensive and important services have been obtained from these very principles, applied to the details."—p. 529.

Participating fully in these views, we shall now enter into a somewhat detailed examination of Dr. Williams' "Principles," and permit our readers to judge of the manner in which he has acquitted himself of his important and, as we think, difficult task.

Chapter first treats of eliology, or the causes of disease. Dr. Williams discards the term *proximote* cause—used by Cullen, after Gaubius—as representing properly the pathological condition, and being rather a part of the disease than a cause; and he divides the *remote* into *predisponent* and *exciting* causes. He includes under the first head, the following:—1, debilitating influences; 2, excitement; 3, previous disease; 4, present disease; 5, hereditary constitution; 6, Temperament; 7, age; 8, sex; 9, occupation. The different subjects are cleverly, though succinctly, handled. The *exciting causes* are subdivided into *cognizable* and *non-cognizable.* The first comprise mechanical and chemical causes; ingesta; violent exertion; mental emotion; excessive evacuation; retention, suppression, and diminution of evacuations; defective cleanliness, ventilation, and drainage; temperature, and changes: the second, the endemic, epidemic, and infectious causes of disease, whose existence can only be inferred, and not proved. Our authors' views on these vexed questions are moderate, and will commend themselves to the reader.

Chapter second is devoted to *pathogeny* or *pathology proper.* As this subject occupies the greater part of the work, and possesses some claims to originality, it will be the chief object of our analysis. The aim and purpose of this portion of the book are thus explained:—

"Disease is a change from the natural condition of the function or structure of the body; but the change is generally more or less compound, involving several elementary functions or structures; and it is obvious that we cannot obtain an

accurate knowledge of the nature of disease until we have ascertained that of its component parts. As the anatomist and the physiologist examine structures and functions by separating or analyzing them into their constituent parts, before he contemplates them in combination, so should the pathologist study these constituent parts, or elements, in *disease*, before he can understand their combinations.*

"The chemist, in the examination of his subjects, finds that there are some principles or elements that cannot be analyzed or divided further; these he calls ultimate or primary elements: others, again, are simple compounds, which may be analyzed: but they occur so constantly, and act so singly in compounding and giving properties to complex matter, that they are called proximate principles or secondary elements. A parallel case might be shown of physical science.

"So it should be with physiology and pathology. There are the healthy and diseased *primary* or *ultimate elements* of *structure*—muscular fibre, nervous matter, vascular fibre, and the elementary tissues of membranes, glands, skin, and other parts; and there are *primary elements*, healthy and diseased, of *function* of these same structures—irritability, tonicity, nervous properties, to which may be added, because at present we cannot analyze it, the power of secretion and nutrition; and lastly, the constituents of the blood. And there are the *secondary* or *proximate elements* of disease, composed of the preceding primary elements, but still simple in comparison with the complex conditions of disease which they combine to produce.

"The varieties of disease affecting these several elements may be comprehended under the heads of *degree* and *kind*; degree, including *excess* and *defect*, or alterations of *plus* and *minus*: and kind, relating to changes not comprised under these heads, but otherwise expressed by the term *perversion*. By applying these heads to the elements of structure and function, we obtain a simple and comprehensive classification, which embraces all the important topics of general pathology."—pp. 67–8.

"These primary and secondary elements of disease are the especial subjects of general pathology. By the study of them we become acquainted with the materials of disease, and their relations to each other; we learn how special diseases arise, and of what they consist: how they produce their phenomena and effects, how they are to be known, distinguished, and classified. Out of such a knowledge, where it is correct, sufficient, and combined with an ample acquaintance with the properties of remedial agents, arises the rational method of relieving, curing, and preventing disease, the great ends of the art of medicine.

"I readily admit that our knowledge of these elements or principles in pathology, is as yet too limited to be entitled to rank as a complete science; but I think that the attempt to describe and illustrate them will be useful, not only by making available all that is known on the subject, but also by showing what is not known, and needs investigation: thus suggesting fit subjects for further research."—pp. 69–70.

Under the head of functional or dynamic diseases, the first of the primary elements noticed is muscular irritability. This may be *excessive*, constituting spasm or convulsion; or it may be *defective*.

Section second treats of tonicity. Our author defines this property of all muscular structures, and of some which are hardly accounted muscular, as "a tendency to slow, moderate contraction, not essentially terminating in relaxation;" and keeping "the parts in which it resides in a certain degree of tension."

"This tone keeps muscles and limbs in their places when at rest, and out of their places when dislocated: if one set of muscles is paralyzed, the tone of their antagonists draws the parts in an opposite direction, as we see in paralysis of the portio dura on one side of the face. A similar property is possessed by the intes-

* "A neglect of this precept has greatly retarded the advancement—nay, even the formation—of pathological science. Men have begun with the very complex problems of *inflammation* and *fever*, before they have made themselves acquainted with the elementary properties of textures, or even of vessels. The result has been, that the most profound reasoning and ingenious speculations have been wasted on nonentities, such as spasm of the extreme vessels, increased action of the capillaries, &c.: and even observation has been confused by the complexity of the subjects brought under it."

tinal tube, the urinary bladder, the air tubes, and the middle coat of the arteries, and gives them a constant tendency to contract on their contents. In these, but particularly in the arteries, it performs an important part, both in health and in disease. By this the arteries contract, when they cease to receive blood from the heart, and thus are found empty after death. It adapts them to different degrees of fulness, yet maintains in their walls a certain tension favourable to equality in the motion of the blood."—p. 74.

The distinct property of tonicity and irritability has been asserted, and it is said that though irritable fibres possess tone, tonic textures are not irritable.

"This," says Dr. Williams, "is not true with regard to the arteries: for I have many times distinctly seen them slowly contract, and remain contracted, at a point to which an irritant, mechanical, chemical, or electric, has been applied. The late discovery, by Henle, of a structure distinctly muscular in arteries, confirms this observation. I have proved, in like manner, the irritability of the air tubes, which move more rapidly under a stimulus than the arteries; whilst that of the intestines is still higher in degree, but still inferior to that of the œsophagus and voluntary muscles, the contractions of which, on the application of a stimulus, are abrupt, and immediately followed by relaxation. So far, then, it appears, that tonicity is influenced by the same agents which excite irritability; but another agent, temperature, seems to affect them differently. Cold increases tonicity and impairs irritability. Under the influence of cold, vessels generally, but especially arteries, shrink in size very remarkably; and the muscles and other textures present a firmness and contraction which impede the quickness of motion characterizing the highest degrees of irritability. Under the influence of heat, on the other hand, although muscles are relaxed, they are more irritable, and the pulsations of the heart are more frequent.

"Cold and heat, therefore, become the best tests for tonicity; and by their means we find this property to be possessed by textures which are not distinctly muscular; I mean, the veins and the cutis, which in a remarkable degree contract with cold, and become relaxed with heat."—pp. 75–76.

Tonicity is an important property in the animal economy, the preservation of health often depending on its integrity, its modifications being peculiarly felt in the vascular system.

"Practical men have long admitted the existence of something of this kind, without defining or localizing it; and the terms tone and atony, bracing and relaxation, tonic and relaxing remedies, become quite appropriate in connection with this property."—p. 76.

Excessive tonicity is caused by an over-nourishing and stimulating regimen, with insufficient exercise; a dry bracing air; tonic medicines: the excitement of fever, &c. In inflammatory fever, excessive tone of the vascular system is a chief constituent. The remedial measures are those which relax the tonic fibre, and increase the secretions, as warm bathing, exercise, sudorifics, aperients, diuretics, and moderate diet, with probably antimony.

In *defective* tonicity, the muscles are flabby, and incapable of continued exertion, though sometimes irritable, with the tremulousness of debility. The heart is irritable, and easily excited to palpitation: the pulse soft and yielding: "it may be full when slow, and sharp when frequent; but it is without firmness or endurance and is easily accelerated. Another distinctive character is its retardation, increasing the interval between the heart's beat and distant pulses; so that the radial pulse is often felt after the second sound of the heart is heard; the tubes being less tense, the pulse-wave is slower than usual. Sometimes the absence of that tightening of the walls of the arteries by which the tonic fibres control their movements, permits their mechanical elasticity to come into play, and this reacting after each stroke of the heart gives that peculiar reduplication or rebounding of the pulse, which has long been described under the term *dichrotous* pulse. This is often observed in convalescence from fevers and other diseases after the subsidence of vascular excitement. A loose relaxed state of the vessels renders the circulation in distant parts weak, so that the extremities are cold, whilst the head and internal organs may be congested. Sudden exertion or change of posture may disturb the circulation and cause faintness or giddiness. Want of tone also in the stomach and intestines causes indigestion and costiveness, and permits them to become

distended with wind and accumulating feces. The secreting organs, irregularly supplied with blood, are also liable to disorder, being either scanty, depraved, or profuse and watery."—pp. 77–78.

In individuals with the system in such a state of atony, there is decided proclivity to certain diseases. There is no power to resist depressing agents, as malaria, infection, &c. On exposure to cold, the blood is quickly driven from the surface to the internal organs, causing congestion and inflammation.

"The proper remedies for defective tonicity are tonics, which are agents that tend to increase the tone of the whole system, particularly of its muscular and vascular parts. We have already stated that cold has this effect in a marked degree, and in truth, cold, properly applied, is one of the best tonics which we possess. For this purpose its application should be sudden and too brief to cause depression or any of its morbid effects. The shower-bath and plunge-bath are the most effectual forms; and free sponging, with cold salt water, is applicable even to weak subjects. A pure bracing air and much exposure to it, with moderate exercise, have also useful tonic effects. There are many medicinal tonics, the most effectual of which are bark and its preparations, medicines containing iron, and the mineral acids. Generous living may be considered a part of a tonic plan, in so far as it tends to enrich the blood, which sustains tonicity as well as all other vital properties."—pp. 78–79.

In the third section, on diseased sensibility, Dr. Williams holds this language:

"An anodyne influence more powerful in degree, than that induced by any other agent, although transient in duration, is that resulting from the inhalation of the vapour of sulphuric ether, which has during the last year been extensively used, first in America, and subsequently in this country. The operation of this agent, and of nitrous oxide gas (which has a similar effect), is on the sensorium, rather than merely on the sensitive nerves. In most instances, if continued for a sufficient time, it induces complete insensibility, so that the subject may undergo the most severe surgical operation, and a female may go through the process of parturition, without suffering any pain. In many cases, however, especially where the inhalation has been less prolonged, or less impregnated with ether, sensibility is blunted, but not destroyed, and the patient makes movements and may utter expressions indicative of slight pain, yet has no recollection of it when restored to consciousness. The memory seems to be more affected than the perceptive function. The power of voluntary motion is suspended in about the same ratio as sensibility; but the reflex motions of the eyelids, breathing, &c., are lowered but not abolished, unless the inhalation be continued so long as to induce complete asphyxia.

"The operation of ether vapour is obviously narcotic, like that of opium and alcohol; and is more speedy and transient, because it passes freely and directly through the lungs into the arterial blood and affects the brain, and is as promptly dispersed by its diffusion throughout the body. It has been maintained by many, that it operates by its interference with the respiration, inducing a degree of asphyxia: but so far is this from being the case, that its best effects are produced when the respiration is steadily maintained; and it has always appeared to me that the end to be aimed at in the administration of ether-vapour, is to narcotize, as far as possible, without too much embarrassing the breathing. This is difficult to accomplish without a freer supply of oxygen than atmospheric air contains; and I should expect safer and more satisfactory results from the inhalation of a mixture of ether-vapour with oxygen gas, which might be continued with safety for a much longer period than with the vapour and air only.

"Although the chief influence of etherization is transient, yet by saving the nervous system from the shock of intense temporary pain during an operation or paroxysm of suffering, it often prevents that consequent nervous irritation and exhaustion which is as injurious to the vital powers, and which favours the return of the painful attack. Thus in neuralgic and painful spasmodic affections, the removal of one or more paroxysms by etherization may break the habit of diseased action, and effect a permanent cure."—pp. 81–82.

Sections fourth and fifth are on diseased voluntary action, and the diseases of reflex and sympathetic nervous influence. Though short they are highly instruct-

ive, and exhibit the thorough and correct knowledge of the author of the physiology of the nervous system.

In the sixth section on secretion, Dr. Williams says:

"I have for the last twenty years* advocated the opinion recently advanced by Dumas and Liebig, that the formation of the principles of the chief secretions takes place through chemical affinities, especially those of the absorbed oxygen and the constituents of the blood, controlled by vital agencies; but this view leaves still as a vital property the power which the liver has to separate bile; the kidneys, urine; mucous membranes, mucus, &c.

"We are thus led to consider secretion as a peculiar property of the secernent structures, just as irritability is of muscular fibre; and as such its disorder constitutes a primary element of disease. In doing this we avoid the hypothesis of some physiologists, who ascribe secretion to nervous influence, a notion by no means accordant with numerous facts."—pp. 100–1.

The influence of the blood—the material from which the secreted matter is supplied—on the quantity and quality of the product, as well as that of the nervous system, are mentioned as important elements in derangement of the process. The effects of *excessive* secretion are both *forwards* and *backwards*.

"The *forward* effects of an excessive secretion of bile depend on its stimulating properties. It irritates the intestinal tube, causing a bilious diarrhœa or cholera. The symptoms of this consist in an exaggeration of those properties of the alimentary canal which have already been described as elements of disease.' Thus the bile irritating causes increased irritability, and more rapid motion of the matter through the tube: pain from exalted sensibility; vomiting, straining, and cramps, from exalted excitomotory function; profuse mucous secretion from excited secernent function."

"But excessive secretion may also have effects *backwards*, on the *organs*, and on the *blood* from which it proceeds. Excessive secretion often weakens the vital properties of the *organ*, so that, in its proper function, it subsequently becomes torpid. Thus after diarrhœa the bowels often become torpid from defective secretion. So, too, in cases where an excessive secretion continues for a long time, it generally is impaired in its quality from a similar cause.

"Excessive secretions, if abounding in animal matter, may not only reduce the mass of the blood, but also affect its composition. Thus bile and urine, which differ much in composition from the blood, if separated in unusual proportions, must leave the blood modified. Urine contains a great preponderance of azote; and its excessive formation from the principles of the blood would leave a predominance of hydrogen and carbon in this fluid. The bile, again, abounds in hydrocarbon, the copious removal of which would leave a superfluity of azote. It may be objected to this statement, that according to the opinion of some chemists, the urine and the bile are not formed from the constant elements of the blood, but from materials derived from the food, and from the decay or transformation of the tissues. To this it may be replied, that this opinion is at present no more than hypothetical; and should it prove to be true, it would not affect the undoubted fact, that the secretions of the liver and of the kidneys are intended to balance one another, and the removal of carbon from the lungs; and that whether the materials from which these eliminating processes are supplied be the principles of the blood itself, or the decayed constituents of tissues, or matters derived from the food, the co-operation of all these processes will be generally required to maintain a uniformity in the composition of the circulating fluid: so, too, if one of these processes is more active than the others, the blood must suffer by the excess of those matters which the less active processes allow to accumulate in it. A clinical illustration of this position may be found in cases of bilious diarrhœa or cholera. This flux of bile is either accompanied by a highly loaded state of the urine, or by fever; in the latter case, the fever does not subside until the urine becomes very copious, or deposits an abundant sediment. The most probable interpretation of this fact is, that the excessive secretion of bile disorders the composition of the blood; so long as the Kidneys rectify this disorder by separating, in greater abund-

* In a thesis, *De sanguine ejusque mutationibus*, Edin. 1824. See also Med. Gaz., September and October, 1835.

ance, the solid contents of the urine, no fever results; but if the kidneys fail in this task, fever ensues, and continues until they accomplish it; then a free secretion and copious deposit is symptomatic of the decline of the fever."—pp. 102–3.

The morbid effects of *defective* secretion may be, also, both *forwards*, on the parts for which the secretion is intended, and *backwards*, on the organ and on the blood from which it should be eliminated.

"The most remarkable of the *backward* effects of defective secretion are instanced in case of the excretions. The distinctive materials of the secretions of urine and bile appear to be positively noxious, and poison the system if not separated from the blood. Thus the sudden suppression of urine or bile causes typhoid symptoms, extreme depression, and coma, which speedily end in death; and, in such cases, urea, or the colouring matter of the bile, has been found in various organs. Where the suppression is incomplete, the poisoning process is more tardy; various functional and visceral derangements are produced, such as delirium or lethargy, dyspnœa, palpitation, vomiting, diarrhœa, dropsical effusions, structural degenerations, &c., which always cause injurious effects, if the defective excretion be not restored. But the amount of these effects will depend on the extent, and especially on the suddenness of the diminution of the excretion; and it is very remarkable when it is very gradual how little disturbance it may for some time induce. In these gradual cases, still more remarkably than in those of more sudden suppression, some of the excrementitious matters may be detected in the blood and in other fluids and solids of the body. Thus in some structural diseases of the liver, the colour of the bile becomes manifest, first in a yellow, and by accumulating, in a deep greenish colour in all the textures, constituting the yellow and the black jaundice. In granular degeneration of the kidneys, in which scarcely any urea is excreted by these glands, this principle is found in the blood and various fluids of the body. In the case of a patient of mine affected with ascites from disease of the heart, liver, and kidneys, Mr. Garrod obtained nearly four grains of nitrate of the urea from an ounce of the peritoneal fluid, and a considerable quantity of bright yellow solid matter, probably bilirus. In other cases I have known the fluid of ascites and anasarca from diseased kidneys emit a decidedly urinous smell, and exhibit on analysis easily appreciable quantities of urea. One of my pupils, Mr. Palmer, detected urea in the serum contained in the ventricles of the brain, in a case of fatal apoplexy from granular kidneys and diseased heart."—pp. 106–7.

In idiopathic fevers, the excretions are frequently defective, and many of the constitutional symptoms in this class of diseases are no doubt due to this cause. During the Edinburgh epidemic of 1843, crystals of the nitrate of urea were obtained from the serum of the brain, and from the blood, in several cases, by Dr. Henderson and Mr. M. W. Taylor.

"There can be little doubt that a morbid element, which in its extremes acts so injuriously as to cause serious disorder, and even speedy death, must in slighter degrees be an important cause and constituent of disease; and I believe that gout, rheumatism, and many cachectic states leading to diseases of nutrition, degenerations, dropsies, &c., are essentially connected with defective excretion."—p. 107.

In speaking of the special stimulants of the secreting organs, it is properly observed, that, "if used in excess, or too long, may not only cause general weakness, but also exhaust the vital properties which they excite; and the result may be a diminution either of the secreted fluid, or of its most characteristic constituents. Hence the long or excessive use of mercury causes torpidity of the liver; that of purgatives, imperfect action of the bowels; that of diuretics, scanty urine, or albuminous or watery urine, defective in urea. These facts point out the expediency of intermitting the use of these agents, and of alternating or conjoining them with others calculated to improve the vital properties of the textures generally, which may often be effected by the medicines called tonic, and by regimenal means which improve and equalize the state of the circulation, and preserve the digestive and assimilative functions in the best order. In illustration of this position, I may refer to the acknowledged advantage of giving bitters with or after mercurial courses; chalybeates with or after saline aperients and diuretics, when these are long used; and these additions, which alone, or used at first, would check the secretion to be increased, now sustain it and render it permanent. Some

medicines which are inferior in efficacy to those already named, are yet, in some instances, more eligible for chronic cases of defective secretion: because they are less exhausting, and combine some measure of tonic influence with that of increasing the secretions. As examples of this kind may be named taraxacum, preparations of iodine, sarsaparilla, nitric and nitro-muriatic acids. Courses of these medicines are sometimes of great efficacy in keeping free the secretions after they have been restored by more powerful means; and they likewise often improve the functions of digestion and nutrition."—pp. 108–9.

The diseases of the constituents of the blood is begun in the seventh section, and continued through the eight remaining ones of the chapter. These sections are amongst the most important and valuable in the work, and we especially recommend them to the reader. They are admirably executed. The subject is fully through concisely treated.

Treating of the morbid changes of the blood, Dr. W. observes:

"These, like those of the solids, may be often traced to individual elements, of which the blood is composed, the changes of which must be viewed as ultimate elements of disease, and are therefore properly included in the present division. But as the blood also operates as a whole, compound indeed in itself, but simple in its influence on vital functions and structures, it forms a proper connecting link between *ultimate* and *proximate* elements of disease. So, also, inasmuch as it is, in some respects, an organized compound, the materials of which are changed, together with its functions, and contributes to the production of change of structure in the solids of the body, the consideration of its changes will be a proper introduction to that of alterations in the circulation, which induce changes of structure, and thus lead to structural diseases themselves."—p. 111.

The properties of the circulating fluid are first examined with reference to those which are most elementary, or to its respective constituents. "We have, then, to consider—

1. The red particles,
2. Fibrin and colourless globules,
3. Albumen and other dissolved animal matters,
4. Oil,
5. Salts,
6. Water,

} in excess, defect, and alteration."

In speaking of the alterations in the colour, shape and size of the red corpuscles in connection with the medium, Dr. W. says:

"It is highly probable that similar changes may take place in the living body, from circumstances which greatly alter the proportion of saline matter and water in the blood. May such change contribute to produce the serious symptoms, and even sudden death, which have ensued on drinking a large quantity of water after great exertion? Has it aught to do with the reaction and irregular excitement sometimes occurring after excessive losses of blood? Or with the symptoms of suffering which animals manifest at the instant of injecting water into their veins? Dr. Owen Rees has suggested that the remarkable diminution of the blood discs in cases of albuminuria may be due to their destruction in consequence of the draining away of albumen from the blood, and thus reducing it to a very watery state; and the same circumstance may prevent their development from the chyle and lymph, both in these cases, and in chlorosis. In several cases of Bright's disease of the kidney I have observed the blood discs jagged or crenate at their margins, and otherwise imperfect; and the same remark has been made by Simon of Berlin and others, and by Andral in a case of chlorosis. In one fearfully rapid example of albuminuria, which proved fatal in six days, with effusion of pus in the joints the day before death, I found the colooring matter dissolved in the blood-liquor after death, and scarcely any red discs remaining. There were numerous pus globules in the blood. A similar total destruction of the blood discs was observed in University College Hospital in the blood of a person who died of malignant scarlet fever with purpura. I have met with similar proofs of breaking up of the red particles, but to a much smaller extent, in acute purpura connected with jaundice, and in cases of disturbed function of the liver without jaundice; is this

doe to the remarkable solvent power exercised by small proportions of bile on the red particles, noticed by Simon and others?"—pp. 114–15.

The same broken condition nf the red corpuscles was noticed by M. Renzi, of Naples, in an epidemic typhus which prevailed in certain districts of Italy, in 1841, as well as in the Edinburgh epidemic fever before alluded to.

The section on the changes of the blood from the transformatinn of chyle and of the textures, including the processes of nutrition and reparation, is particularly valuable from its suggestive character, and from the intrinsic importance of the subject. Most pathologists now regard gout to depend on the accumulation in the system of an excess of lithic acid. This view, inferential previously, has recently been demonstrated to be correct, in the case of a patient of the nuthor in whose blood lithic acid was detected. There was total absence uf lithic acid in the urine, until during the exhibition of colchicum, when its characteristic crystals appeared under the microscope. The patholngy of both gout and saccharine diabetes is admirably given, and we regret that we cannot transfer it to our pages. The treatment indicated is sound and discriminating. We have room only for the concluding paragraphs.

"In the effect which each exerts on the economy, there is a great difference between the morbid matter of gout and that of diabetes. The sugar in the latter has no tendency to accumulate in the system and produce local effects; but, acting as a powerful diuretic, it passes rapidly away, carrying with it a great quantity of water and of the other constituents of ordinary urine; and the thirst, dry skin, and emaciation of diabetes, seem to be chiefly due to this mode of operation. The common complication of diabetes with pulmonary consumption shows also, however, that the plastic process is degraded.

"The lithic acid of gout and gravel, on the other hand, has a tendency to accumulate in the body, and to cause the local and general irritations which have been already mentioned. Hence it becomes a chief indication to counteract its irritating properties, and to promote its elimination from the system. The medicines which are most efficacious in doing this are alkalies, or their carbonates, or their vegetable salts, with colchicum, or iodide of potassium, saline mineral waters, and alterative aperients. These all increase the action of the kidneys and intestinal canal, and drain off the offending matter from the system: but the operation of colchicum is far more certain than that of the others: and its permanent efficacy depends on its continued action on the kidneys in particular."—pp. 156–57.

Chapter third is occupied with the consideration of the secondary or proximate elements of disease, consisting of two or more primary elements. "They comprise, at least, three of the *primary* elements which have been considered—the blood and its constituents, the irritability and the tonicity of the organs concerned in its distribution."

Anæmia is the first of these conditions treated of. The most common causes of general anæmia Dr. Williams considers to be irregularity of the menstrual function.

"It might seem difficult to understand," he observes, "how the last operates: but that in many cases it is a cause and not an effect of anæmia, is plain from the well-known fact that no signs of anæmia have occurred until cold, over-exertion, or mental excitement, or some circumstance, has suddenly checked the flow of the catamenia; it has not returned; and then the patient begins to lose colour, and gradually to exhibit the anæmic state. In many cases I have known this occur in young females who have previously suffered from acute rheumatism, implicating the heart. It would seem that in these cases some injury is done to the blood particles and to the powers by which they are repaired: this is manifest not only from the pallidity, but from the yellowish and almost greenish hue which the complexion sometimes presents, and which obviously depends on a discoloration of the textures by the altered blood, as in the neighbourhood of a bruised part. The nature of these changes has been already noticed. In some of these cases of chlorosis, the appetite is depraved; there is such a complete disrelish for animal food and other nourishing articles, and such a craving for sour things, and even for matters destitute of nourishment, as chalk, cinders, &c., that it might be supposed that this perverted appetite is the cause of the anæmia, by deterring the patient from taking that food which is capable of making red blood; and undoubt-

edly such an appetite, when indulged, most contribute to this result; but it is not so constantly present as to be considered the chief cause of the anæmia in the examples under consideration."—p. 163.

Though the general symptoms of anæmia are those of weakness, still it is often accompanied by others of an opposite character, and which lead the inexperienced practitioner into error. Instead of depression there is irritation and exaltation of function, particularly in the nervous system.

"Sensibility is sometimes acute; there is intolerance of light and sound, with flashes in the eyes, noise in the ears, a sense of rushing in the head, and various neuralgic pains. The excitomotory nerves are sometimes excited, and spasms or convulsive affections of different kinds may be present, or the organic functions may be affected, and palpitation, spasmodic asthma, vomiting and such sympathetic irritations, may occur. In a few instances, anæmia has been attended with delirium, or mental excitement bordering on it.

"It thus appears that the functions which frequently are thus excited in the midst of general depression and weakness, are those of the nervous centres; and the generally nervous character of persons in a state of great weakness is connected with the same fact, so that *nervousness* and *weakness* are almost synonymous terms. No explanation of this apparent anomaly has been to my knowledge proposed, but one seems to suggest itself in the peculiar distribution of the circulation through the nervous centres. When the mass of blood is reduced in quantity, the blood-vessels generally contract in proportion, their tonicity adapting them to the amount of their contents. But the vessels within the skull and spinal canal cannot contract with the same facility, for not being exposed to atmospheric pressure, and some of them being fixed in bony canals, they do not shrink as the blood becomes reduced, and therefore they retain more than their proper share of the circulating fluid.* This disproportionate amount of blood in the nervous centres produces different effects according to the degree in which the heart's propulsive power reaches it. Under the influence of temporary palpitation, fever, or other kind of excitement, the brain and spinal cord, through their uncontracted vessels which are among the nearest to the heart, receive an unusual share of its exalted but partial force; an erethism of some one or more of the functions of these nervous centres is the consequence; and pain, spasm, sensorial excitement, intolerance of light and sound, or sympathetic irritations of some kind or another, occur.† In this condition the head may be hot and throbbing, the face flushed, the eyes suffused, whilst the extremities and the surface generally are comparatively bloodless, and either cold or very speedily becoming so on exposure. Epistaxis sometimes occurs, and although bringing momentary relief, may, if considerable, add to the evil, by increasing the anæmia."—pp. 165, 6, 7.

But the heart may be too enfeebled to propel onward the blood accumulated in the cerebral vessels, particularly the veins. Congestion of this organ is a necessary result; and we accordingly have "headache and giddiness, relieved by the recumbent posture, drowsiness, impaired mental faculties, obscured vision and hearing, partial paralysis, and, in extreme cases, coma or catalepsy."—p. 167.

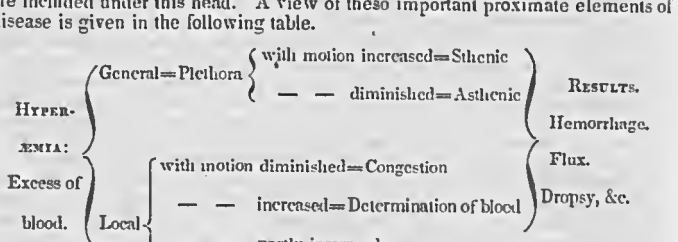
* This statement is not invalidated by the recent experiments of Dr. G. Burrows, (Med. Gaz., April, 1843.) His experiments and expositions very satisfactorily demonstrate the absurdity of the notions, founded on Dr. Kellie's paper, that the quantity of blood in the head is always the same; but it remains clear that the circulation within the head and spinal canal, especially in man, is affected by losses of blood differently from the circulation in other parts.

† Although the chief effect of excitement of the circulation in anæmia is thus directed to the nervous centres, it is by no means confined to them. Other parts in the immediate vicinity of the heart become the seat of increased arterial pulsation and disturbance. Thus a painful throbbing is often complained of in the throat, chest, and epigastrium even when there is little pulse in distant arteries, and the extremities are cold. To understand these facts, we must bear in mind that when the arteries are full and tense, they oppose their fulness and tension to each contraction of the heart, which resistance reduces the strength of each pulse in the vicinity of the heart, although it continues to propagate it to a distance; but when the arteries are empty and loose, the heart squirts into them the blood in an unresisted jet, the force of which is strong near the heart, but extends not to distant arteries.

"This congestion may be only temporary, and lead to no serious results; but in some cases I believe there occurs an event that has not been noticed by pathologists—namely, a coagulation of the blood in the sinuses, and a consequent permanent obstruction to the passage of the blood through the brain. I have met with several cases more or less corresponding with the following description.

"A young female becomes anæmic, and after exhibiting various symptoms of feeble general circulation, with headache, drowsiness, and impaired sensorial functions, suddenly becomes worse; passes into a state of stupor with dilated pupils, sometimes varied by slight manifestations of delirium, throbbing of the carotids, and partial heat of the head, and dies comatose. On opening the head, a small quantity of serum is found under the arachnoid and in the ventricles, sometimes with a little lymph (in one case there was none). The vascularity of the membranes is remarkable, but the vessels most distended are the veins, and in the larger of these and in the longitudinal sinus, there is a firm coagulum. In parts, especially at the torcular Herophili, this coagulum blocks the whole sinus, and exhibits a separation of fibrin, portions of which are softened down into that opaque purilaginous matter which was long mistaken for pus, but which Mr. Gulliver has shown to be a mere disintegration of the fibrin which mere stagnation in a warm temperature may effect. These have been taken for cases of meningitis. No doubt inflammation may supervene in them occasionally, but in two cases that have fallen under my notice, there was no adhesion of the arachnoid nor deposit upon it, nor any other unequivocal mark of inflammatory action; yet the fibrinous and bloody concretions in the veins and sinuses were most remarkable for their size and firmness."*—p. 167.

We pass to the next division *Hyperæmia* or *Excess of Blood.* Several conditions are included under this head. A view of these important proximate elements of disease is given in the following table.



After treating of Plethora, *sthenic* and *asthenic*, Dr. Williams passes to the consideration of Congestion, or local hyperæmia, with diminished motion. We cannot now discuss the theoretical portion of this section, and though not disposed to give our unqualified assent to all the views of the author on this subject, still we regard them as generally sound.

The symptoms and effects of Congestion are detailed with great clearness and precision, both as regards the local effects, and those on the system at large. As a specimen, we extract the following regarding the pathology of Bright's disease:—

"I have for several years referred albuminous urine to congestion of the kidney; and this view has been lately confirmed by some experiments by Mr. G. Robinson. The following considerations led me to entertain this opinion:—1. The urine often becomes albuminous during great embarrassment of the circulation in cases of organic disease of the heart or lungs, when the kidneys are otherwise healthy. 2. I have in many instances observed temporary albuminuria during the cold stage of ague, and the congestive stage of eruptive fevers. 3. In

* A wax model of the sinuses and membranes in one of these cases is in the museum at the University College. Cruveilhier gives a representation of a similar case, which, without sufficient reason, he considers as one of cerebral phlebitis. Andral mentions a case of cerebral hemorrhage in connection with anæmia, which was probably of the same kind.

granular degeneration of the kidney, the amount of albumen in the urine is augmented by circumstances causing congestion of the kidney, and is reduced by remedies suited to remove this. 4. The most common form of Bright's disease of the kidney in its earliest stage, presents the appearance of a highly congested structure, and is excited by causes calculated to produce congestion, such as frequent irritation of the kidneys by stimulating liquors—congestion from exhausted tone; continued exposure to cold, especially after the kidneys have been thus excited—congestion from impulsion; scarlatina probably operates as the two last combined. 5. The albumen in the urine abounds most in the congestive (first) stage of Bright's disease—the vessels becoming more or less obstructed in the progress of the disease by a deposit of fibrin with granular cells in the tubules, and in some instances around them, which deposit at the same time perpetuates some degree of congestion, whilst it supersedes the proper secreting structure." —p. 193.

The remedies indicated for the treatment of congestion are judicious.

Section fifth treats of local hyperæmia, with increased motion, or determination of blood. There is nothing here that need detain us, though the section is an admirable one.

The results of hyperæmia, as hemorrhage, flux and dropsy, occupy the succeeding section. It teaches right doctrine, and will be read with advantage. The soundness of the following remarks on the treatment of dropsy depending on visceral disease, cannot be disputed.

"The tendency of dropsy connected with diseased heart, kidneys, or liver, to recur again and again, and become chronic, renders it needful to vary as much as possible the remedies employed, as well as to use means to support the strength. It is an important point in the treatment of such cases not to exhaust the powers of any secreting organ by too long acting on it, and not to expend the efficacy of any one remedy by too long continuing its use. By employing sometimes diuretics, sometimes purgatives, sometimes diaphoretics, and by aiding each of these, by local depletion or derivants, or by stimulants and tonics, according to the temporary prevalence of vascular fulness and excitement, or the converse, much may often be effected to prolong life. It is in the application of these rules to the treatment of prolonged cases, that the skill and resources of the rational practitioner are most tried, and his superiority over the routinist is best proved. It is under these circumstances, too, advantageous to have at command a great variety of medicines, particularly diuretics, and to alternate them or vary them in order to increase or maintain their effect. Those that I have found most effectual are—combinations of mercury, squill, digitalis, and conium (not in acute albuminuria); combinations of decoction of broom, or pyrola umbellata, with nitrate and acetate of potass; the juice or extract of taraxacum, with the same salts or bitartrate of potass, or with nitric acid (particularly in hepatic disease); infusion or tincture of digitalis, with iodide of potassium, and bitartrate of potass (in dropsy after scarlatina); the same, together with increasing doses of tincture of cantharides (in asthenic cases of albuminuria, after cupping to the loins and hydragogue purgatives); ammonio-tartrate and ammonio-citrate of iron in Seltzer water (in asthenic dropsy); gin in cream of tartar beverage (imperial); compound spirit of juniper, spirit of nitric æther, with various others (in cases of debility). The latter stimulant diuretics have disappointed me more than any of the rest."—pp. 241–242.

The seventh section is the most elaborate in the work, both theoretically and practically; it is an exposition of the important subject of *inflammation*, in all its phases and varieties: a subject which has always attracted the first attention of the pathologist.

The pathological definition given by Dr. Williams to distinguish inflammation from the other varieties of hyperæmia is—"*too much blood in a part, with motion* (of that blood) *partly increased, partly diminished.*"—p. 244.

"But besides this pathological definition, its outward characters may be briefly defined in the four signs which, from the time of Celsus, have been considered distinctive of inflammation, *redness, heat, pain*, and *swelling*. These signs are sometimes produced by congestion, and by determination of blood; but in a degree less marked, and for a time less continued, than in inflammation; and

although there are cases and forms of inflammation in which it is not possible to detect all these marks, they may still be said to constitute its most general character. In common with other varieties of local hyperæmia, inflammation nwes the sign of redness to the excess of blood in the part, but we shall find that this redness is heightened by a peculiar concentration nf the particles in the inflamed vessels, which is also the cause of the peculiar results of the process. As in determinatiun of blnod, the heat and pain are in part due to the increased motion of the blood; but in inflammatioo, they ore exaggerated by the motion being opposed tn obstruction. As with nther forms of hyperæmia, the swelling arises partly from the overdistension of the blnnd-vessels, and partly from effusinns from them: but in these effusions, inflammation differs fmm congestion and simple determination, departing still further than these from the natural quantity and quality of the effnsed matters."—pp. 244–245.

It has been the custom to refer the first movement of inflammation to the nerves. Dr. Williams adduces the followiog argumcots to show that an impression oo the nerves is not essentially a part of the first process of inflammation.

"1. Some of the causes of inflammation (the majority of those indneing internal inflammation) prnduce on the nerves nr nervous system no known primary effect, which resembles that of other causes of inllammation (irritants): thus, inflammatioos excited by cold nre often preceded by no marked nervous disturbance; whereas the strongest impressions of cold on this system are frequently not fnllowed by inflammation. 2. Inllammatinns often originate in congestions, and in the sudden suppression of hemorrhages and other discharges, without the occurrence of any symptnms referable tn the nerves: hence inflammatinns thus arising may escape detection, and are called *latent*. 3. Persons in whnm nervnns properties are most developed, are not those mnst susceptible of inflammation; and all varieties of nervous excitement are snmetimes manifest in the highest degree without any inflammation ensuing. Eveo where pain and other oervous symptoms are excessive, and are the result of mechanical or chomical injuries (such as crushed limbs, extensive burns, &c.), inflammatinn sometimes does not follow; and this has led surgeons long to distiognish between irritation and ioflammatino. 4. Inflammation readily occurs in parts, the nerves of which are paralyzed or have been divided."—pp. 249–250.

"So far as it is known, the blood-vessels are the essential seat of the whnle process of inflammation; and although some of the exciting causes of inflammation (irritants), act on the nerves as well, yet others operate chiefly and essentially only on the blood-vessels. Heoce we tiod that the causes predisposing to inflammatinn are circumstances chiefly affecting the vascular system."—p. 250.

Having traced the essential operation of the causes of inflammatinn to be on the blood vessels and their contents, Dr. Williams next prneeeds to the inquiry nf "what is the character of their operation on the vessels, and what phenomena it develops."

That the blood vessels are enlarged in inflammation is obvious to the most superficial observer, and has been proved by the experiments of Hunter, Alison, and others; but such is the case, too, in congestioo. In what respect then does inflammation differ from congestion, and in which also the vessels are enlarged?

"It differs nnt ooly in the aeopmpanying symptoms nod in its products, but alsn in the observed condition of the vessels of the part. Thus besides greater pain and heat in an inflamed part, and earlier and more abundant effusions into or from it, the mnre florid hue nf redness, the strnng beating of the arteries leading to the part, and augmented quantity nf blnod flowing from its veins, clearly indicate that there is increased motion of the blood, instead of diminished motion, as in congestion."—p. 251.

It is certain, from the observations of Lawrence and others, as well as from direct observation with the microscope, that the vessels in the vicinity of the inflamed part are the channels of an increased flnw of blood; but if this were all, there would be no distinctinn between determinatinn of blood and inflammation.

"Mieroscopic researeh has established one great point of difference. The nbservations of Thnmson, Hastings, Kaltenbrnnner, and Marshall Hall, have long clearly proved that there is more or less *obstruction* to the passage of the blood in

the vessels most inflamed. Thus in the frog's web, when a part inflames from local irritation, the blood is seen to move more slowly in the part most irritated, and gradually accumulating in the vessels, renders them larger, redder, and more tortuous, until the motion ceases altogether in them, whilst neighbouring vessels are still the channel of an increased current. A chief point, then, in which inflammation differs from determination of blood, is in the retarded or arrested flow of blood in some of the vessels. This answers to the definition which we have given of inflammation: *too much blood in a part, with motion (of that blood) partly increased, partly diminished.*"—p. 252.

The cause of this retarded flow of blood through an inflamed part has always been a difficult problem for pathologists to solve. Cullen supposed it to depend on spasm of the extreme vessels. Wilson Philip ascribed it to a weakness of the capillaries, which he believed incapacitated those vessels from transmitting the blood. John Hunter taught that there was something active and vital in the enlargement of inflamed vessels, and he used the term "active dilatation;" and Kaltenbrunner, and other German writers, adopted the same idea, when they spoke of "vital turgescence," "turgor vitalis," "inflammatory erection," and analogous terms. The microscope shows the extreme vessels to be in a state of dilatation, not of spasm, and thus Cullen's hypothesis falls. To Philip's theory, Marshall Hall and others have objected by saying, that the capillaries, by their contraction, do not aid in the circulation of the blood, and that their "debility," therefore, cannot be a sufficient cause for interrupted passage of blood through them. The words of Hunter convey no meaning. The idea of Haller and some of his followers, ascribing the circulation of the blood in part to certain supposed properties of vital attraction and repulsion, by which the blood is drawn into, or repelled from particular parts, independently of all motion of the living solids—has been recently disinterred and advocated by Prof. Alison of Edinburgh. He regards changes in these assumed vital attractions and repulsions to be the chief elements in the process of inflammation. This hypothesis assumes the existence in the fluids and solids of the living body of properties as distinctly vital as that of contractility or sensibility; and, moreover, ascribes to these fluids and solids, powers of attraction and repulsion at *sensible* distances, like the attractions of electricity, magnetism, or gravitation, yet distinct from all these, and sometimes opposed to them. It attributes, in the language of our author, to the living body a new physical power, and almost a discerning intelligence in the exercise of that power. Undoubted facts are necessary before this hypothesis can be received; and Dr. Williams well observes:—

"Now, before the existence of such a power can be admitted, it must be proved that the phenomena of living structures are not and cannot be explained through any known vital or physical agencies. We have already adduced and referred to arguments and observations to show that the *known* physical and vital properties of the living body will account for the chief phenomena of health and disease without assuming the existence of any forces of a mysterious character; and we have now to consider whether the same thing may be done with regard to inflammation. If we succeed in explaining the nature and effects of inflammation by a reference to ascertained properties, it will be needless and unphilosophical to assume the existence of others, which are mysterious and unknown. We do not pretend to propose these explanations as complete or certain, but as the best that we can devise in the present state of science, and the most consistent with well-established facts; and it is very satisfactory to observe that the discoveries in chemical physiology made since the first edition of this work was written, so far from invalidating these views on the nature of inflammation and its results, go far to confirm and extend them."—p. 255.

What, then, is the cause of the stagnation or tardy motion of the blood in the most enlarged capillaries, in the midst of surrounding increased flow, and which is the great characteristic of inflammation? Is it in the vessels, or in the blood, or in both? The latter, our author thinks, we shall find to be the true case.

"In determination of blood, the arteries are enlarged, and so are the capillaries in due proportion; the circulation is therefore equally increased. In congestion,

the capillaries are enlarged, without any increase of the arteries: the motion is therefore impaired; but still, being gentle, it may diffuse itself through the mass, which moves slowly. But if to congested capillaries there be added the increased and abrupt force of the current from enlarged arteries, or if to determinntion of blood enlarged arteries and atonic congestinn of the capillaries be joined, the propulsive power of the current will be impaired. As in the experiment with tho intestine, the blood will pulsate or oscillate in tbe distended vessels rather than pass through them; and the main current will pass through collateral anastomosing channels, which become the seat of simple determination or increased flow. This is just the state of things in the incipient stage of inflammation; and if either the capillaries do not speedily recover their tone, or the arterics do not contract, the blood in parts becomes stagnant, its particles adhere to each other, and to the walls of the vessel, and the obstruction is confirmed. The arterial portions of some of the obstructed capillaries are still open, and exposed to pulsative force from the supplying arteries, which continues to strain their coats, and cause an oscillatory motion of their blood particles, but no passage though them. Such aro the phenomena which we see under the microscope."—pp. 256–257.

Hence, then, one cause of the retarded flow of blood in an inflamed part, is a weak, inelastic state of the capillary vessels; such, in fact, as exists in cases of atonic congestion. But it is very certain that tho obstruction, as well as other features of inflammation, depend on "changes which take place in the blood within the inflamed vessels." John Hunter was aware of this, for besides describing the coagulation of the blood in the inflamed vessels, he mentions the adhesion of fibrin to their walls. Gendrin and others have noticed the coagulation of the blood in the inflamed vessels; and Dr. Marshall Hall attributed the obstruction of the vessels in inflamination to tbe adhesion of the blood globules to the walls of the vessels. Dr. Williams thought that microscopical observations should be directed to this point more specially than had hitherto been done; and, accordingly, in 1841, he made many careful examinations of the early stago of inflammation in tbo frog's web. We cannot afford the space to insert our author's recapitulation of them. They formed the subject of his Gulstonian lectures for 1841, and were published in the Medical Gazette of the same year. The result of numerous carefully repeated microscopic investigations was, that the chief cause of obstruction, as to the fluid within the vessels, was due to two circumstances,—tho *increased production of the white globules, and their remarkable disposition to adhere to the walls of the vessels and to one another.* These investigations have been since repeated and confirmed by numerous experienced observers.

The sudden and rapid formation of the colourless corpuscles, Dr. Williams thinks may be explained in this way:

"The blood liquid is highly charged with protein, which needs only a further process of oxidation to assume the solid form of the deutoxide: this process is supplied by the free current of arterial blood (determination) which rushes into the obstructed portions, and brings the red particles, the oxygen carriers, in such forcible contact with blood liquor as favours the transfer of oxygen to the protein contained in it. As the protein becomes oxidized, it consolidates in a granular form, and the more readily around the oily molecules always diffused through tho blood liquid; and these form the nucleoli visible in the larger granules. But the granules also cohere in clusters, and form the pale corpuscles of various sizes which appear adhering to and creeping along the sides of irritated vessels."—pp. 261–2.

The peculiar disposition of the white corpuscles to adhere to the walls of the vessels may be ascribed to the physical property of adhesiveness, common to soft bodies of glutinous materials. In the beginning of the obstruction of tbe inflamed vessels, the red corpuscles are little concerned; they show no disposition to adhere or form rouleaux; but in tbe period of total obstruction these flexible and elastic bodies can no longer pass, but become jammed in such numbers in the interstices of the white corpuscles, that the whole vessel speedily presents an almost homogeneous deep red color, from the great accumulation of red particles.

"It seems, then, to be well established, that an essential part of inflammation is the production of numerous white globules in the inflamed vessels; and that the obstruction of these vessels is mainly due to the adhesive properties of these glob-

ules. The production of these globoles must then be considered as a constant fact in the history of inflammation and nutrition."—p. 265.

The further changes effected by inflammation are the modification in the functions of the involved vessels. This is manifested in different ways in different parts of the inflamed site. Where the flow of blood is increased, the functions will be exalted; whilst if it be obstructed, they will be more or less impaired. The effusions from inflamed vessels, although at first the same as from tense congestion and determination, present, as the inflammation advances, appearances not found in the products of mere congestion or determination. Much precise information on the nature of inflammatory effusions has recently been supplied by the microscope.

"In the frog's web, after inflammation has continued some hoors, there appear outside of the vessels (especially of those in which the strongest current encounters the most completo obstruction) white globules or corpuscles, with specks in them, exactly like tho pale granular globules within the vessels. These are also found in various inflammatory effusions, and are called *exudation corpuscles, granule cells,* or *fibrinous globules.*"—p. 268.

In addition to these bodies, the fibrin effused by an inflamed membrane also contains a mesh of extremely fine fibres, first noticed by Messrs. Gulliver and Addison, as well as some portions of solid effusion with no distinct structure, and which are either irregularly granular, like coagulated albumen, or completely amorphous and homogeneous; with the usual solids generated by the part, as mucous globules, epithelium scales, epidermis and blood corpuscles.

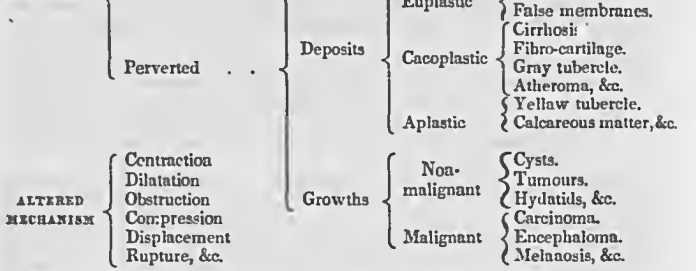
The results of inflammation are thus given:

"Inflammation is always attended with more or less effusion. Where the inflammation is slight, this effusion may remove it by unloading the engorged blood-vessels; but where the inflammation is more intense, that is, where the obstruction is considerablo and the determination of blood strong, the effusion may go on to a great extent without resolving the inflammation. It is then that the more serious effects of inflammation result. The effused matters press on and pervade the adjoining textures, derange their nutrition, and impair their cohesion; and thus takes place the *softening* of textores, which occurs chiefly in thoso of a complex kind, which retain the effused matter. The continued obstruction in the inflamed part leaves the veins and lymphatics free to absorb, and the high pressure and determination of blood tend rather to promote this process of absorption. Hence, as new matters are effused, the old textnre is compressed, disintegrated and absorbed; the finer exudation corpuscles and fibres themselves are removed or altered, and the large pus globules alone remain: this is *suppuration.* Or if the original obstruction of the inflamed vessels be extensive, or bave been rendered so by the subsequent effusion, the supply of blood may be so stopped in a part, that it dies, and the dead part may then either be only dissolved and absorbed at its circumference. and separated from the living textures in form of a *slough;* or if more extensive, the dead part may pass into decomposition before it can he separated; thus occur *gangrene* and *sphacelus.* If the inflammation be of a lower kind, the obstruction less complete, and the effusion more gradual, the nutrition of the natural textnre is only impaired, not arrested, and from the increased deposition of solid matter, *induration* or *consolidation* takes place."—pp. 270–1.

Such is our author's description of the process of inflammation in its intimate nature and phenomena, and we fear that our analysis has conveyed but a feeble idea of the admirable manner in which he has discharged a delicate and difficult task. We pass over the description of tbe symptoms, both local and general, of inflammation, together with the nature and symptoms of the terminations or results of inflammation, which is simple and highly graphic, recent microscopical and chemical observations being laid under heavy cootribution. We would direct particularly tbe notice of the reader to it; be will obtain mucb valuable information on these important subjects in a compact and available form.

In the treatment of inflammation and its results, though there is nothing of novelty advanced, the views which should guide us are laid down most judicioosly, and witb a clearness which makes them comprehensible to the youngest student.

Chapter fourth is on structural diseases or diseases of nutrition. The author's classification of the elements of diseased structure is given in the following table.



We shall be able only to briefly notice some interesting points. In a note at p. 362, speaking of the typhus-material in the intestinal follicles, bronchial glands, lungs, &c., mentioned by Rokitansky, Vogel, Engel, and other German pathologists, Dr. Williams, says: "Under the microscope, however, this matter exhibits nothing to distinguish it from bad fibrin or cacoplastic lymph; and in accordance with the view in the text, I consider it to be such, and tending to involve in a process of sloughing the excretory follicles of the intestines by which it is attempted to be thrown off, or inducing a deposit in the lung which has various pernicious tendencies."—p. 362.

The recent and extensive researches of Dr. H. Bennett, published in the *Edinburgh Monthly Journal*,* the results of sixty-three post mortem examinations, would seem to be confirmatory of the opinions of the German pathologists. In addition to the organs already named, Dr. Bennett found infiltrated masses of the typhous deposit in the spleen.

Under the head of cacoplastic and aplastic deposits, there is an exceedingly excellent article on the pathology of tubercle. Dr. Williams refers tubercle "to a degraded condition of the nutritive material from which old textures are renewed and new ones formed; and holds that it differs from fibrin or coagulable lymph, not in *kind*, but in *degree*, of vitality and capacity of organization."—p. 386. These views, which our author has held and taught for many years, have within a short period received demonstrative confirmation by the microscopic observations of numerous observers, and amongst others Mr. Gulliver, who detected in tubercle the materials of lymph, but in a degenerated and confused state, the cells being few, irregular, shrivelled, with imperfect nuclei and incapable of futher development; no fibres being perceptible, and the main substance being composed of panular or amorphous matter.

"The circumstances which degrade the material of nutrition," observes Dr. Williams, "and lead to the deposition of cacoplastic and aplastic matter, may be either local or general. Of the local causes, congestion and the lowest and more chronic forms of inflammation have been mentioned as capable of determining cacoplastic deposits; but even in these cases it is probable that the general cause also more or less operates—that is, a degraded state of the plasma of the blood. Congestions and chronic inflammations certainly cause cacoplastic effusions; but then, such congestions and chronic inflammations do not easily occur in healthy subjects; and the want of health may imply that the plasma of the blood is bad in addition to the local cause. But practically, it is of great importance to keep

* See American Journal for Jan. 1848, p. 241.

in view the local as well as the general cause, for the former is often more tractable than the other, and it is by guarding against it that slighter degrees of the general cause (diseased plasma) may be prevented from doing mischief. But the general cause, when present in great degree, leads to cacoplastic and aplastic deposits, as modifications of ordinary textural nutrition, independently of inflammation or even congestion. This general cause thus prevailing constitutes the chief element of the scrofulous diathesis or tuberculous cachexia, and we have before mentioned that a defect of the red particles and an excess of fibrin in the blood constitute its most remarkable feature. In this condition of the blood there is an increased disposition to deposit, and often an abundance of the fibrinous or nutritive material, but an imperfect vitality or organizability of this material, so that when deposited instead of being assimilated to the textures, it forms the degenerated structures or mere granular or amorphus deposits, which we have been describing. But with this condition of the blood, these deposits must be greatly promoted by all varieties of hyperæmia, and prevail most in organs which receive the largest amount of blood. Hence, the peculiarly pernicious effect of inflammation of internal organs, especially the lungs, in scrofulous subjects. Even acute inflammation may be unequal to raise the nutritive material to a plastic standard at which it may be organized or absorbed, or to mature it to the process of complete suppuration by which it may be speedily excreted; but the matter thrown out is cacoplastic or curdy lymph, remarkable for its opacity and want of cohesion, or a caseous kind of pus, inorganizable, inert, irremovable by absorption, and permanently obstructing or compressing the structures in which it accumulates, until it gradually excites an irregular destructive suppuration or ulceration, forming vomicæ, or imperfect abscesses pervading the structures, and without walls capable of healing, whilst under the depressing and irritating influence of the morbid matter decaying and becoming decomposed, the body wastes with hectic fever, night sweats, and colliquative diarrhœa. So likewise fevers, by causing congestions in organs, lead to the production of a *crop* of these deposits, from which tuberculous disease takes its origin."—pp. 396–7.

The several circumstances which contribute to render the lungs especially liable to tuberculous deposit, are, in the author's opinion, "1. Their great vascularity and the large quantity of blood that passes through them, which makes them largely partake of any disorder in the condition of this fluid. 2. There being a chief seat of the formation of fibrin, that principle being more abundant in arterial than in venous blood. 3. The softness and yielding nature of their texture, which permits effusion to take place more readily than denser textures do. 4. Their exposure to external causes of diseases, whether by cold and irritations directly entering by the air-tubes, or by circumstances operating through the medium of the circulation. In hot climates, cacoplastic diseases affect the liver and other abdominal viscera more than the lungs; the same persons there suffering from chronic liver disease and dysentery, who, in a cold climate would fall victims to phthisis."—p. 398.

In the treatment of tubercle, Dr. Williams states that his experience leads him to speak highly of the cod-liver oil; he says that it is "assuredly the most efficacious of all medicinal agents in the treatment of cacoplastic and aplastic deposits, and one which, after two years' constant experience in its use, is still frequently surprising me by the wonders that it occasionally works even in aggravated and advanced cases of scrofula, mesenteric disease, pulmonary consumption, chronic pneumonia and pleurisy, and chronic rheumatism."—pp. 404–5.

The best effects have generally resulted from the use of the purest kind. It is important that it should be as free from taste and smell as possible, and should be deprived of most of the stearine, by cooling and settling, or by filtration. That cod-liver oil owes its efficacy to the iodine it contains, Dr. W., in common with most practitioners who have employed it to any extent, does not believe. His theory of its mode of action will be found in the following extract.

"Such an oil (purified) given in doses gradually increased to a table-spoonful three times a-day, in the great majority of cases, agrees well with the stomach and bowels, increases rather than impairs the appetite, and, if continued for some weeks or even months, promotes in a marked degree the function of nutrition,

increasing the strength as well as the flesh, and giving increment to all the textures. Nor is this surprising when we consider that the nuclei or rudimental molecules of all structures appear to consist of fat, which the nil in its highly divisible state, supplies and renews in the manner most conducive to active and healthy nutrition. Its peculiar fluidity and little proneness to change also enable it to pervade all structures, and to penetrate even into imperfectly organized deposits, and by softening their concrete fatty molecules, and rendering more permeable and supple their whole mass, brings them more under the influence of the adjoining living parts, through the circulation in which either their vitality and nutrition are improved and maintained, or if incapable of improvement, they are gradually dissolved and absorbed away."—p. 404.

The sections on non-malignant and malignant morbid growths, contain a well-digested summary of the best views on these subjects, and may be consulted with profit.

Chapter fifth treats of the classification, symptoms, and distinction of diseases. Semeiology and diagnosis are hardly touched upon. We had hoped that the author's leisure would have enabled him to place these subjects on a level with the rest of the work; but this, it seems, either did not enter into his plan, or else he has, for some reason, been unable to accomplish it. These sections are very unsatisfactory. The section on prognosis has not fared better, but is somewhat redeemed by the excellent account of the various modes of death. The chief varieties are thus tabulated:

Death (cessation of function) beginning at the heart { Sudden=syncope. / Gradual=asthenia.
— — beginning at the breathing apparatus=Asphyxia or apnœa.
— — beginning at the brain=Coma.
— — beginning at the medulla=Paralysis.
— — beginning in the blood=Necræmia (νεκρος, dead; αιμα, blood).

The concluding and seventh chapter, on prophylaxis and hygienics, of forty-four pages, has been nearly entirely added. Though it might, perhaps, have been advantageously extended, it is very valuable, and written with that sound discrimination and good sense which distinguish all the practical portions of the work. It is, indeed, the best hygienic code that we ever remember to have met with.

We now take a regretful leave of Dr. Williams. Of the character and value of the 'Principles,' the reader will be enabled to form an opinion from the analysis we have presented, and the extracts we have made; he will, we believe, think it entitled to claim his best attention, and that its perusal and study will be amply remunerative. It is a work calculated to elevate the character of medical science, from its correct and lucid exposition of the great principles of scientific investigation; and its plain, practical character, will recommend it to the student and practitioner of medicine and surgery. The author observes, "that whilst he feels grateful for the approbation with which this work has been honoured by scientific men, both in this [Great Britain] and foreign countries, he is especially gratified by the favour with which it has been received by practitioners of great experience." We think that the author has ample reason to express the hope that his "attempts to combine science with art, and to place the practice of physic on a more rational basis," have not been altogether unsuccessful.

M. C.